supposed vibratile ampullæ, figured by M. Maas in a larva still having all its peripheral cylindrical cells in place, are nothing but common rounded lacunæ; their limiting cells have no cilia and in no way arise from the layer which clothes the cavity of the larva.

The pores and the oscula are distinct from their origin, the latter being upon the middle convex portion of the young sponge, while the former, which are much more numerous, are situated at the boundary between the convex body and the peripheral membrane, or upon this membrane itself.

In the foregoing paragraphs I have indicated only the general course of the embryogeny. I shall explain shortly how these phenomena are complicated by the division of cells and other details.

In *Aplysilla*, which is a fibrous sponge, the formation of the ectoderm and of the ampullæ is similar, almost to the details, to that which has just been described for *Spongilla*. Just as in *Spongilla*, the mesodermic amœboid cell is cast off at the periphery and remains in the parenchyma outside the ampullæ, while in *Esperella* it remains for a long time in the interior of the ampulla, of the formation of which it has been the centre.

These new observations will be understood as modifying in a certain degree the interpretation which I put forward last year on the subject of the formation of the ampullæ in this latter type.

To conclude: the ectoderm arises at the expense of cells primitively internal; the ciliated cells take no part in its formation; they pass into the interior of the body, are captured by mesodermic amœboid cells, and later on regain their liberty and take part in the formation of the ampullæ and canals. This capture of the ciliated cells is, after all, nothing but a phenomenon of phagocytosis, which is incomplete in that it is temporary. This term is the more applicable, since a certain number appear to be really digested. It is probable that at the moment when they lose their cilia these cells undergo a temporary diminution of their vitality, and that the amœboid cells, working on their own account, capture them as they would food-matter, but do not succeed in digesting them. It is very curious to see an incident of this kind becoming a normal phenomenon of the development. There is something in it which recalls the phenomena of histolysis described by Kovalevsky in the Insects, but with this great difference, that here the elements incorporated by the phagocytes are utilized in the subsequent histogeny directly, and not as simple nutritive matter.—*Comptes Rendus*, tome cxiii. no. 5 (3 août, 1891), pp. 267–269.

On the Development of the Blastodermic Layers in Isopod Crustacea (Porcellio scaber). By M. Louis Roule.

In a former note I have explained the origin of the blastoderm in the embryos of *Porcellio*. The germinal disk, containing the nucleus of the oosperm, envelops the nutritive yolk, borrowing therefrom the necessary protoplasm for this extension; its nucleus divides, by the usual process of karyokinesis, into several segments, which again undergo division; and the whole is thus converted into cells, which rapidly increase in number. On the completion of this

stage the nutritive yolk is surrounded by a simple layer of blastodermal elements.

The blastoderm then proliferates in several regions and upon the inner surface. One of these regions, which occupies the future median and ventral line of the embryo, extends from the anterior to the posterior extremity of the ovum; a projecting band arises, which advances into the yolk, and rapidly divides into two parallel and adjoining zones. This parallel band will give origin to the nervous centres; it is interrupted beneath the anterior pole of the body, at a spot where the stomodœumm appears; divided in this way, its anterior portion constitutes the rudiment of the brain and its posterior section that of the ventral cord.

At the moment when the first indications of the nervous centres are seen, the blastodermal elements multiply in two regions situate upon the sides of the embryo, a little behind the cerebral rudiment and on both sides of the median line. Each of these tracts soon exhibits, beneath the blastoderm, a layer of cells which extends in three directions—above, below, and behind. When the extension in the two former directions has arrived at a certain point it stops, and the layer of cells buries itself horizontally, by its upper and lower edges, in the nutritive yolk, upon which it acts like a punch. This new extension ceases when the two edges reach the median line; they then bend inwards, and, continuing to grow, approach one another until they meet and unite. Each layer has thus formed a tube, which occupies the greater portion of the corresponding half of the body of the embryo, and the cavity of which, closing behind, contains the nutritive yolk which it has imprisoned during its development. These two tubes are the rudiment of the organ erroneously termed the Crustacean *liver*; this organ, bounded by the endoderm of which we have just traced the mode of formation, should be regarded as the enteron of these animals; its functions, moreover, notably in the case of the lower Crustacea, are nutritive rather than glandular.

Apart from the liver, the remainder of the alimentary canal is derived from two opposite blastodermic invaginations, one of which is inferior and somewhat ventral, the other superior and slightly dorsal. The two depressions sink into the yolk in order to meet one another; they first touch, then fuse, and the region of their juncture unites with the liver at two points. The anterior or stomodeal invagination produces the œsophagus and stomach, while the posterior or proctodeal gives rise to the intestine.

The mesoderm arises while these different processes are in progress. This layer is produced by the elements of the blastoderm; the majority of these divide into segments, the external of which continues to form part of the blastodermal layer, while the internal penetrates into the yolk. The latter divides in its turn into several other cells, and, the same thing happening for the whole of the blastoderm, the aggregate of these elements constitutes the mesoderm. The principal zones of proliferation are situated on the ventral face of the body, at the base of the limbs; they are consequently two in number, situated one on each side of the median

line. The mesodermic cells are nourished at the expense of the nutritive yolk which surrounds them; they develop in the typical mesenchymatous fashion, and the cavities which arise between them to form the vascular canals are at their commencement little confluent lacunæ of irregular outline. None of these cavities can be considered as corresponding, whether in its mode of development or its origin, to the mesodermal zoonites of the Annelids.

The blastoderm provides for these different proliferations without losing the appearance of a simple epithelial layer surrounding the nutritive yolk; it retains this condition after the rudiments of the mesoderm with those of the endoderm have arisen at its expense and separated from it; it then represents the ectoderm.—*Comptes Rendus*, tome cxii. no. 25 (22 juin, 1891), pp. 1460–1462.

On the Development of the Mesoderm of Crustacea, and on that of the Organs derived from it. By M. Louis Roule.

I have shown in a former note (June 1891) *, on the basis of the embryonic stages of *Porcellio scaber*, Latr., the process of the formation of the endoderm; the layer is produced from a pair of rudiments arising from two symmetrical regions of the anterior portion of the blastoderm. The mesoderm also has the same origin, with this difference, however, that the mode of development is much less regular.

My observations have been conducted upon *Porcellio scaber* and *Palæmon serratus*, Fabr. At the moment when the cells of the blastoderm are multiplying in the median ventral line for the production of the nervous centres, and on the sides of the anterior extremity of the body to give rise to the rudiments of the endoderm, two new zones of proliferation appear, one on either side of the ventral nervous band. The different regions of each zone are not perfectly similar; some, separated by equal distances, are thicker than others, and raise up the blastoderm which covers them and from which they have arisen; these elevated spots are the rudiments of the limbs. The blastoderm left at the periphery will become the ectoderm of these appendages; the central mass of cells represents the mesoderm; the cells of this mass become transformed into muscle-fibres in the way which I have described in a previous note ('Comptes Rendus,' January 1891).

An analogous multiplication of cells takes place throughout the entire blastoderm, except in those regions which furnish the rudiments of the nerve-centres and of the endoderm, only the process is less vigorous; its effect is to produce the elements which penetrate into the yolk lying beneath the blastoderm, and destroy it little by little by feeding upon the nutritive materials which it contains. These elements correspond to the *vitelline cells* of authors, as to which opinions have been so numerous and so contradictory; they all arise from the blastoderm alone, and are destined to form the mesoderm of the body, without there being any differences of development between them or ground for distinguishing between a primary and secondary mesoderm. Receiving their proper situation

* *Vide suprà.*